

**UNIVERSITY OF SWAZILAND**

**MAIN EXAMINATION 2014/15**

**FACULTY OF SCIENCE**

**DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING**

**TITLE OF PAPER:      ENGINEERING MANAGEMENT**

**COURSE CODE:        EE512**

**TIME ALLOWED:      THREE HOURS**

**INSTRUCTIONS:**

- 1) Answer any FIVE of the SIX questions.
- 2) Each question carries 20 marks distributed as shown on the right margin.
- 3) A sheet of Selected Formulas and a PV Table are attached.

**THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE  
INVIGILATOR**

### Question 1.

Donna Jamison was recently hired as a financial analyst by Brickley Electronics, a manufacturer of electronic calculators. Her first task was to conduct a financial analysis of the firm covering the last two years. To begin, she gathered the following financial statements and other data.

BALANCE SHEETS	19x2 E x000	19x1 E x000
<b>Assets:</b>		
Current assets:		
Cash	1,200.00	2,350.00
Accounts receivable	6,000.00	4,000.00
Inventories	8,000.00	10,000.00
Prepaid expenses	300.00	120.00
Total current assets	<u>15,500.00</u>	<u>16,470.00</u>
Fixed assets		
Land	4000.00	4000.00
Buildings and equipment	12000.00	8500.00
Total fixed assets	<u>16000.00</u>	<u>12500.00</u>
Total assets	<u><u>31500.00</u></u>	<u><u>28970.00</u></u>
<b>Liabilities and Equity:</b>		
Current liabilities:		
Accounts payable	5,800.00	4,000.00
Notes payable	300.00	600.00
Accruals	900.00	400.00
Total current liabilities	<u>7,000.00</u>	<u>5,000.00</u>
Long term liabilities		
Long-term debt	<u>7,500.00</u>	<u>8,000.00</u>
Total liabilities	<u><u>14,500.00</u></u>	<u><u>13,000.00</u></u>
Equity:		
Stock	8,000.00	8,000.00
Paid in capital	1,000.00	1,000.00
Total paid in capital	<u>9,000.00</u>	<u>9,000.00</u>
Retained earnings	8,000.00	6,970.00
Total equity	<u>17,000.00</u>	<u>15,970.00</u>
Total liabilities and equity	<u><u>31,500.00</u></u>	<u><u>28,970.00</u></u>

### INCOME STATEMENTS

Sales	52,000.00	48,000.00
Cost of goods sold	<u>36,000.00</u>	<u>31,000.00</u>
Gross margin	<u>16,000.00</u>	<u>17,000.00</u>
Operating expenses:		
Selling expenses	7,000.00	6,500.00
Administrative expenses	<u>5,860.00</u>	<u>6,100.00</u>
Total operating expenses	<u>12,860.00</u>	<u>12,600.00</u>
Net operating income (EBIT)	3,140.00	3,900.00
Interest expense	<u>640.00</u>	<u>700.00</u>
Net income before taxes	2,500.00	3,200.00
Income taxes (30%)	750.00	960.00
Net income (or netprofit margin)	<u><u>1,750.00</u></u>	<u><u>2,240.00</u></u>

Assume that you are Donna Jamison's assistant, and that she has asked you to help her prepare a report which evaluates the company's financial condition. Then answer the following questions.

- a. What is the purpose of financial ratio analysis, and what are the five major categories of ratios? ( 3 marks)
- b. What are Brickley Electronics' current and quick ratios? What do they tell you about the company's liquidity position? ( 5 marks)
- c. What are Brickley Electronics' inventory turnover, days sales outstanding, and total assets turnover ratios? What do these ratios suggest about the company's financial affairs? ( 7 marks)
- d. What are the firm's debt and times-interest-earned ratios? What can you say about the company's leverage? ( 5 marks)

## Question 2

**(NPV and payback analysis)** Perot Industries has E100 000.00 to invest. The company is trying to decide between two alternative uses of funds. The alternatives are:

### Expected Net Cash Flow

Year	Project A	Project B
0	-E 100,000.00	-E 100,000.00
1	E 21,000.00	E 16,000.00
2	E 21,000.00	E 16,000.00
3	E 21,000.00	E 16,000.00
4	E 21,000.00	E 16,000.00
5	E 21,000.00	E 16,000.00
6	E 29,000.00	E 16,000.00

- a) Name the 5 methods for appraising projects and their advantages ( 5 marks)
- b) Calculate the payback period for each project ( 4 marks)
- c) At 14% cost of capital calculate the NPV of each project ( 4 marks)
- d) At 8% cost of capital calculate the NPV of each project ( 4 marks)
- e) Which project would you choose? ( 3 marks)

### Question 3

Northwood Company manufactures basketballs. The company has a standard ball that sells at E25.00. At present, the standard ball is manufactured in a small plant that relies heavily on direct labour workers. Thus, variable costs are high, totalling E15.00 per ball. Last year, the company sold 30,000 balls, with the following results:

		<b>Per ball</b>
Sales (30 000 standard balls).....	E 750,000.00	E 25.00
Less variable expenses:.....	E 450,000.00	E 15.00
Contribution margin.....	E 300,000.00	E 10.00
Less fixed expenses .....	E 210,000.00	
Net Income .....	E 90,000.00	

- a) Calculate the CM ratio and break- even point ( 4 marks)
- b) If variable costs per ball increase by E3.00, what will the new CM and Break-even point? ( 4 marks)
- c) Refer to b) above. If the expected change in variable costs takes place, how many balls will have to be sold next year to earn the same net income (E90 000.00) as last year? ( 4 marks)
- d) Refer again to b) above. The company is considering automating the plant. This automation would reduce the variable costs per ball by 40%, but would double the fixed costs (E420 000). What would be the new CM ratio and break-even point? Would you approve the automation and why? ( 4 marks)
- e) Refer to d) above. If the new plant is built, how many balls will have to be sold to maintain the net income of E90 000.00 ( 4 marks)

#### Question 4

- a) Define Cost-Benefit Analysis (CBA) ( 5 marks)
- b) What can we use Cost-Benefit Analysis for? ( 4 marks)
- c) Your community wishes to construct a dam in your area. How can you use the Cost-Benefit Analysis to illustrate to the community whether this is worthwhile project to embark on? ( 9 marks)
- d) Briefly discuss one way we can measure the Cost- Benefit of a project. ( 2 marks)

### **Question 5**

In organisations, Groups are increasingly being used as an effective means for attaining organisational goals. The context, people, task requirements, formal organisation and group culture are key elements we need to analyse to understand a group's output. Under each one of the five, list four factors we have to look at while analysing performance.

(20 marks)

### Question 6

- a. Define Management. ( 4marks)
- b. What are the four functions of management? ( 4marks)
- c. Under each of the four functions state, state 3 things that are involved. (12 marks)



# Useful Formulas

Ratio	Formula for Calculation
<b>Liquidity</b>	
Current	$\frac{\text{Current assets}}{\text{Current liabilities}}$
Quick, or acid, test	$\frac{\text{Current assets} - \text{Inventories}}{\text{Current liabilities}}$
<b>Asset Management</b>	
Inventory turnover	$\frac{\text{Sales}}{\text{Inventories}}$
Days' sales outstanding (DSO)	$\frac{\text{Receivables}}{\text{Annual sales}/360}$
Fixed assets turnover	$\frac{\text{Sales}}{\text{Net fixed assets}}$
Total assets turnover	$\frac{\text{Sales}}{\text{Total assets}}$
<b>Debt Management</b>	
Total debt to total assets	$\frac{\text{Total debt}}{\text{Total assets}}$
Times-interest-earned (TIE)	$\frac{\text{Earnings before interest and taxes (EBIT)}}{\text{Interest charges}}$
Fixed charge coverage	$\frac{\text{Earnings before interest and taxes} + \text{Lease payments}}{\text{Interest charges} + \text{Lease payments} + \frac{\text{SF payments}}{(1 - T)}}$
<b>Profitability</b>	
Profit margin on sales	$\frac{\text{Net income available to common stockholders}}{\text{Sales}}$
Basic earning power	$\frac{\text{Earnings before interest and taxes (EBIT)}}{\text{Total assets}}$
Return on total assets (ROA)	$\frac{\text{Net income available to common stockholders}}{\text{Total assets}}$
Return on common equity (ROE)	$\frac{\text{Net income available to common stockholders}}{\text{Common equity}}$
<b>Market Value</b>	
Price/earnings (P/E)	$\frac{\text{Price per share}}{\text{Earnings per share}}$
Market/book	$\frac{\text{Market price per share}}{\text{Book value per share}}$

TABLE 1  
Present Value of 1 due at the end of the year shown  
Various Discounting Rates

Years	1%	2%	3%	4%	5%	6%	7%	8%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259
2	0.9803	0.9612	0.9426	0.9246	0.9070	0.8900	0.8734	0.8573
3	0.9706	0.9423	0.9151	0.8890	0.8638	0.8396	0.8163	0.7938
4	0.9610	0.9238	0.8885	0.8548	0.8227	0.7921	0.7629	0.7350
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	0.7130	0.6806
6	0.9420	0.8880	0.8375	0.7903	0.7462	0.7050	0.6663	0.6302
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	0.5820	0.5403
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.4970	0.4440	0.3971
13	0.8787	0.7730	0.6810	0.6006	0.5303	0.4688	0.4150	0.3677
14	0.8700	0.7579	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405
15	0.8613	0.7430	0.6419	0.5553	0.4810	0.4173	0.3624	0.3152
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919
17	0.8444	0.7142	0.6050	0.5134	0.4363	0.3714	0.3166	0.2703
18	0.8360	0.7002	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317
20	0.8195	0.6730	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987
22	0.8034	0.6468	0.5219	0.4220	0.3418	0.2775	0.2257	0.1839
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.2470	0.1971	0.1577
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.2330	0.1842	0.1460
26	0.7720	0.5976	0.4637	0.3607	0.2812	0.2198	0.1722	0.1352
27	0.7644	0.5859	0.4502	0.3468	0.2678	0.2074	0.1609	0.1252
28	0.7568	0.5744	0.4371	0.3335	0.2551	0.1956	0.1504	0.1159
29	0.7493	0.5631	0.4243	0.3207	0.2429	0.1846	0.1406	0.1073
30	0.7419	0.5521	0.4120	0.3083	0.2314	0.1741	0.1314	0.0994
31	0.7346	0.5412	0.4000	0.2965	0.2204	0.1643	0.1228	0.0920
32	0.7273	0.5306	0.3883	0.2851	0.2099	0.1550	0.1147	0.0852
33	0.7201	0.5202	0.3770	0.2741	0.1999	0.1462	0.1072	0.0789
34	0.7130	0.5100	0.3660	0.2636	0.1904	0.1379	0.1002	0.0730
35	0.7059	0.5000	0.3554	0.2534	0.1813	0.1301	0.0937	0.0676
36	0.6989	0.4902	0.3450	0.2437	0.1727	0.1227	0.0875	0.0626
37	0.6920	0.4806	0.3350	0.2343	0.1644	0.1158	0.0818	0.0580
38	0.6852	0.4712	0.3252	0.2253	0.1566	0.1092	0.0765	0.0537
39	0.6784	0.4619	0.3158	0.2166	0.1491	0.1031	0.0715	0.0497
40	0.6717	0.4529	0.3066	0.2083	0.1420	0.0972	0.0668	0.0460
41	0.6650	0.4440	0.2976	0.2003	0.1353	0.0917	0.0624	0.0426
42	0.6584	0.4353	0.2890	0.1926	0.1288	0.0865	0.0583	0.0395
43	0.6519	0.4268	0.2805	0.1852	0.1227	0.0816	0.0545	0.0365
44	0.6454	0.4184	0.2724	0.1780	0.1169	0.0770	0.0509	0.0338
45	0.6391	0.4102	0.2644	0.1712	0.1113	0.0727	0.0476	0.0313
46	0.6327	0.4022	0.2567	0.1646	0.1060	0.0685	0.0445	0.0290
47	0.6265	0.3943	0.2493	0.1583	0.1009	0.0647	0.0416	0.0269
48	0.6203	0.3865	0.2420	0.1522	0.0961	0.0610	0.0389	0.0249
49	0.6141	0.3790	0.2350	0.1463	0.0916	0.0575	0.0363	0.0230
50	0.6080	0.3715	0.2281	0.1407	0.0872	0.0543	0.0339	0.0213
51	0.6020	0.3642	0.2215	0.1353	0.0831	0.0512	0.0317	0.0197
52	0.5961	0.3571	0.2150	0.1301	0.0791	0.0483	0.0297	0.0183
53	0.5902	0.3501	0.2088	0.1251	0.0753	0.0456	0.0277	0.0169
54	0.5843	0.3432	0.2027	0.1203	0.0717	0.0430	0.0259	0.0157
55	0.5785	0.3365	0.1968	0.1157	0.0683	0.0406	0.0242	0.0145
56	0.5728	0.3299	0.1910	0.1112	0.0651	0.0383	0.0226	0.0134
57	0.5671	0.3234	0.1855	0.1069	0.0620	0.0361	0.0211	0.0124
58	0.5615	0.3171	0.1801	0.1028	0.0590	0.0341	0.0198	0.0115
59	0.5560	0.3109	0.1748	0.0989	0.0562	0.0321	0.0185	0.0107
60	0.5505	0.3048	0.1697	0.0951	0.0535	0.0303	0.0173	0.0099

PRESENT VALUE OF 1

Years	9%	10%	11%	12%	13%	14%	15%	16%
1	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621
2	0.8417	0.8264	0.8116	0.7972	0.7831	0.7695	0.7561	0.7432
3	0.7722	0.7513	0.7312	0.7118	0.6931	0.6750	0.6575	0.6407
4	0.7084	0.6830	0.6587	0.6355	0.6133	0.5921	0.5718	0.5523
5	0.6499	0.6209	0.5935	0.5674	0.5428	0.5194	0.4972	0.4761
6	0.5963	0.5645	0.5346	0.5066	0.4803	0.4556	0.4323	0.4104
7	0.5470	0.5132	0.4817	0.4523	0.4251	0.3996	0.3759	0.3538
8	0.5019	0.4665	0.4339	0.4039	0.3762	0.3506	0.3269	0.3050
9	0.4604	0.4241	0.3909	0.3606	0.3329	0.3075	0.2843	0.2630
10	0.4224	0.3855	0.3522	0.3220	0.2946	0.2697	0.2472	0.2267
11	0.3875	0.3505	0.3173	0.2875	0.2607	0.2366	0.2149	0.1954
12	0.3555	0.3186	0.2858	0.2567	0.2307	0.2076	0.1869	0.1685
13	0.3262	0.2897	0.2575	0.2292	0.2042	0.1821	0.1625	0.1452
14	0.2992	0.2633	0.2320	0.2046	0.1807	0.1597	0.1413	0.1252
15	0.2745	0.2394	0.2090	0.1827	0.1599	0.1401	0.1229	0.1079
16	0.2519	0.2176	0.1883	0.1631	0.1415	0.1229	0.1069	0.0930
17	0.2311	0.1978	0.1696	0.1456	0.1252	0.1078	0.0929	0.0802
18	0.2120	0.1799	0.1528	0.1300	0.1108	0.0946	0.0808	0.0691
19	0.1945	0.1635	0.1377	0.1161	0.0981	0.0829	0.0703	0.0596
20	0.1784	0.1486	0.1240	0.1037	0.0868	0.0728	0.0611	0.0514
21	0.1637	0.1351	0.1117	0.0926	0.0768	0.0638	0.0531	0.0443
22	0.1502	0.1228	0.1007	0.0826	0.0680	0.0560	0.0462	0.0382
23	0.1378	0.1117	0.0907	0.0738	0.0601	0.0491	0.0402	0.0329
24	0.1264	0.1015	0.0817	0.0659	0.0532	0.0431	0.0349	0.0284
25	0.1160	0.0923	0.0736	0.0588	0.0471	0.0378	0.0304	0.0245
26	0.1064	0.0839	0.0663	0.0525	0.0417	0.0331	0.0264	0.0211
27	0.0976	0.0763	0.0597	0.0469	0.0369	0.0291	0.0230	0.0182
28	0.0895	0.0693	0.0538	0.0419	0.0326	0.0255	0.0200	0.0157
29	0.0822	0.0630	0.0485	0.0374	0.0289	0.0224	0.0174	0.0135
30	0.0754	0.0573	0.0437	0.0334	0.0256	0.0196	0.0151	0.0116
31	0.0691	0.0521	0.0394	0.0298	0.0226	0.0172	0.0131	0.0100
32	0.0634	0.0474	0.0355	0.0266	0.0200	0.0151	0.0114	0.0087
33	0.0582	0.0431	0.0319	0.0238	0.0177	0.0132	0.0099	0.0075
34	0.0534	0.0391	0.0288	0.0212	0.0157	0.0116	0.0086	0.0064
35	0.0490	0.0356	0.0259	0.0189	0.0139	0.0102	0.0075	0.0055
36	0.0449	0.0323	0.0234	0.0169	0.0123	0.0089	0.0065	0.0048
37	0.0412	0.0294	0.0211	0.0151	0.0109	0.0078	0.0057	0.0041
38	0.0378	0.0267	0.0190	0.0135	0.0096	0.0069	0.0049	0.0036
39	0.0347	0.0243	0.0171	0.0120	0.0085	0.0060	0.0043	0.0031
40	0.0318	0.0221	0.0154	0.0107	0.0075	0.0053	0.0037	0.0026
41	0.0292	0.0201	0.0139	0.0096	0.0067	0.0046	0.0032	0.0023
42	0.0268	0.0183	0.0125	0.0086	0.0059	0.0041	0.0028	0.0020
43	0.0246	0.0166	0.0112	0.0076	0.0052	0.0036	0.0025	0.0017
44	0.0226	0.0151	0.0101	0.0068	0.0046	0.0031	0.0021	0.0015
45	0.0207	0.0137	0.0091	0.0061	0.0041	0.0027	0.0019	0.0013
46	0.0190	0.0125	0.0082	0.0054	0.0036	0.0024	0.0016	0.0011
47	0.0174	0.0113	0.0074	0.0049	0.0032	0.0021	0.0014	0.0009
48	0.0160	0.0103	0.0067	0.0043	0.0028	0.0019	0.0012	0.0008
49	0.0147	0.0094	0.0060	0.0039	0.0025	0.0016	0.0011	0.0007
50	0.0134	0.0085	0.0054	0.0035	0.0022	0.0014	0.0009	0.0006
51	0.0123	0.0077	0.0049	0.0031	0.0020	0.0013	0.0008	0.0005
52	0.0113	0.0070	0.0044	0.0028	0.0017	0.0011	0.0007	0.0004
53	0.0104	0.0064	0.0040	0.0025	0.0015	0.0010	0.0006	0.0004
54	0.0095	0.0058	0.0036	0.0022	0.0014	0.0008	0.0005	0.0003
55	0.0087	0.0053	0.0032	0.0020	0.0012	0.0007	0.0005	0.0003
56	0.0080	0.0048	0.0029	0.0018	0.0011	0.0007	0.0004	0.0002
57	0.0074	0.0044	0.0026	0.0016	0.0009	0.0006	0.0003	0.0002
58	0.0067	0.0040	0.0024	0.0014	0.0008	0.0005	0.0003	0.0002
59	0.0062	0.0036	0.0021	0.0012	0.0007	0.0004	0.0003	0.0002
60	0.0057	0.0033	0.0019	0.0011	0.0007	0.0004	0.0002	0.0001